Ollscoil na hÉireann, Gaillimh *GX_____*

National University of Ireland, Galway

Autumn Examinations 2008

Exam Code(s)	3IF1
Exam(s)	3rd B.Sc. In Information Technology
Module Code(s)	CT332
Module(s)	Database Systems II
Paper No.	
Repeat Paper	
External Examiner(s)	Prof. John A. Keane
Internal Examiner(s)	Prof. G. Lyons Mr. C. O'Riordan
Instructions	Answer any 3 questions All questions carry equal marks.
Duration	3 hours
No. of Answer books	1
No. of Pages	4
Department(s)	Information Technology

OLLSCOIL na hEIREANN
THE NATIONAL UNIVERSITY of IRELAND

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AUTUMN EXAMINATIONS 2008

Third University Examination in Information Technology

CT332 DATABASE SYSTEMS II

Q.1. i) A database and website is required for a restaurant and pub recommender system.

The data requirements gathered to date are as follows:

Information is to be stored on pubs (location, short description, name, price level (expensive, moderate, cheap), and whether food is served or not.

Information is to be stored on restaurants: location, name, description, opening hours, type of foods and price range.

In order to make recommendations to users and potential customers, the following information is also required.

User details: name, id, contact details (may be phone number, email address, address), any reviews on any restaurants or pubs they may have given (the text of the review, date of review). Users may also opt to give ratings (a number in the range 1-5) for any of the venues.

Note that some venues may serve as both pubs and restaurants and users may leave reviews and rating on either or both venues.

Special events may also be associated with any location (music, exhibitions). The date and a short description of the event should be stored. Users may also review such special events.

Develop an EER diagram which correctly captures these requirements. State any assumptions you make. (18)

ii) Map the EER diagram created in part i) to a suitable relational schema. (15)

Q.2. i) Explain briefly the importance of concurrency control in multi-user databases. Outline the problems that may arise if concurrency control is not enforced. (6)

ii) Timestamping and two-phase locking are two approaches to ensuring concurrency control. Outline *either* approach and present pseudo-code for the primitives used. Show how the following schedule would proceed under *either* protocol.

Ta	**Tb**	**Tc**
	read(Y)	
	write(Y)	
read(X)		
write(X)		
		read(Z)
		write(Z)
	read(X)	
	write(X)	
read(Z)		
		read(Y)
		write(Y)

(17)

iii) Explain the differences in recovery processes for systems operating under the deferred update protocol and the immediate update protocol. Explain how recovery mechanisms can be implemented in distributed databases. (10)

Q.3. i) Given the following company database schema:

EMPLOYEE: RSI, Fname, Lname, Salary, Address, Age, Dno
DEPARTMENT: Dno, Dname, Description
DEPT_LOCN: Dno, DLocation
PROJECT: Pno, Pname, Budget, Proj_Desc, Plocation
WORKS_ON: RSI, Pno, Hours

provide an SQL query for the following:

List all employees (Fname, Lname) who work for a department based in "Dublin" *or* who have worked more than 10 hours on a project located in "Dublin".

Outline the process of heuristic optimisation. Develop an operator tree that represents an efficient evaluation strategy for the above query. (15)

ii) Discuss the structure of a B tree and describe, with an example, the algorithm for insertion of values into a B tree. (9)

iii) Compare, in terms of data retrieval in databases, the efficiency the B Tree and B+Tree data structures. (9)

Q.4. i) Compare object-oriented and relational models – describe the differences in models and query languages supported. (8)

ii) Explain the steps you follow to map an EER model to a suitable design for an object-oriented database. (8)

iii) With respect to deductive databases, discuss briefly how queries are answered by the deductive databases. Comment on the expressiveness of the Datalog query language in comparison to SQL in a relational database. (8)

iv) Consider the following simple fragment from a deductive database schema:

```
publication(p_id, name, year).
person(a_id, a_name).
wrote(a_id, p_id).
```

Develop simple Datalog queries to handle the following information needs:

a) List all publications published in 1999 or 2003.
b) List the name of all papers written in 2003 or written by an author name “murphy”
c) List all people who have written a paper with “murphy”. (9)